BMP4 regulation of human trophoblast development.

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Public Summary:
This is a thorough review of early placental development in the human, and how the growth factor, bone morphogenetic protein-4 (BMP4), induces differentiation of placental cell lineage in pluripotent stem cells.

Scientific Abstract:
Since the derivation of human embryonic stem cells, and the subsequent generation of induced pluripotent stem cells, there has been much excitement about the ability to model and evaluate human organ development in vitro. The finding that these cells, when treated with BMP4, are able to generate the extraembryonic cell type, trophoblast, which is the predominant functional epithelium in the placenta, has not been widely accepted. This review evaluates this model, providing comparison to early known events during placentation in both human and mouse and addresses specific challenges. Keeping in mind the ultimate goal of understanding human placental development and pregnancy disorders, our aim here is two-fold: to distinguish gaps in our knowledge arising from mis- or over-interpretation of data, and to recognize the limitations of both mouse and human models, but to work within those limitations towards the ultimate goal.